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Eight New species of *Lomachaeta* Mickel and the Synonymy of *Smicromutilla* Mickel (Hymenoptera: Mutillidae)

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Abstract.—*Smicromutilla* Mickel is determined to be a junior synonym of *Lomachaeta* Mickel. *Lomachaeta powelli* Mickel, **comb. nov.**, and *L. beadugrimi* Pitts & Manley, **comb. nov.**, are transferred from *Smicromutilla*. Eight new species of *Lomachaeta* are described: *L. hedera* **sp. nov.**, *L. ilex* **sp. nov.**, *L. litosisyra* **sp. nov.**, *L. megomicron* **sp. nov.**, *L. polemomechana* **sp. nov.**, *L. snellingella* **sp. nov.**, *L. theresa* **sp. nov.**, and *L. vacamuerta* **sp. nov.** *Lomachaeta garm* Williams & Pitts is a **junior synonym** of *L. hyphantria* Pitts & Manley. A revised key to the male species of *Lomachaeta* is provided. New distribution records are given for *L. chionothrix* Pitts & Manley, *L. hyphantria* Pitts & Manley, and *L. ptilohyalus* Pitts & Manley. Male genitalia are illustrated for all new species and the genitalia of *L. powelli* are illustrated for the first time.

Key words.—velvet ant, Sphaeropthalminae, parasitoid, Diodontus, Pisonopsis, Solierella, Trypoxylon

Species of *Lomachaeta* are rarely collected using traditional hand-collecting methods, mainly because of their small size (pers. obs.). Even in Malaise traps, *Lomachaeta* males appear to be especially rare in the eastern United States (Pitts and Manley 2004). In southwestern Nearctic regions, however, males of *Lomachaeta* can be more abundant in Malaise traps, although the females are rarely seen in these traps and are even less commonly hand-collected. Males and females are more reliably collected by rearing them from the nests of their hosts, which are typically small, twig-nesting crabronid wasps [e.g.: *Pisonopsis birkmani* Rowher, *Solierella blaisdelli* (Bridwell), *S. plenoculoides similis* (Bridwell), and *Trypoxylon sp.* Latreille] (Pitts and Manley 2004).

Mickel (1936) originally described *Lomachaeta* to include four species from the southwestern United States: one species from females only, two from males only, and one (type species, *L. hicksi* Mickel) from both sexes. Mickel (1940) added two more Southwestern species to *Lomachaeta*, bringing the total to six. Later a genus closely related to *Lomachaeta*, *Smicromutilla*, was described for the males and females of a single Californian species (Mickel 1964). Casal (1969) described the first two South American *Lomachaeta* species from females only with both species occurring in Argentina. Females of *Lomachaeta* were defined by a combination of characters seen in other mutillid genera, rather than by the unique tergal bristles seen in males. Because no males had been found in South America and females were not distinctive, the generic designation of the Argentine females was debatable. Quintero and Cambra (1996) discovered *Lomachaeta* specimens from Peru during a preliminary faunal study, but, because they were not described, the status of Neotropical *Lomachaeta* remained dubious.

The first revision of the genus was completed by Pitts and Manley (2004). They determined that all of Mickel's *Lomachaeta* species were synonymous, and discovered that the genus ranged throughout the Nearctic region. They described six

new *Lomachaeta* species, discovering males of the first undeniable species in South America, and one new *Smicromutilla* species. This species of *Smicromutilla* was difficult to place as it did not quite fit either genus, but, instead of erecting another monotypic genus, the species was tentatively placed into *Smicromutilla*. Finally, Williams and Pitts (2007) described one new *Lomachaeta* species from Colombia, partially addressing the somewhat disjunct range of the genus, which was previously unknown from northern South America.

Mickel (1964) used numerous characters to separate *Lomachaeta* and *Smicromutilla* when he first described them, and these characters have been used with limited success since then. Some of the subsequently described species (e.g. Casal 1969; Pitts and Manley 2004), and newly discovered species (to be described in this publication) do not fit the combinations of characters used to diagnose these genera. These discoveries necessitate a revision of taxonomic status for *Lomachaeta* and *Smicromutilla*.

Additionally, while studying material from various museums in search of small *Pseudomethoca* males to be used in a separate publication, eight new species were discovered that appear to be intermediate between *Lomachaeta* and *Smicromutilla*. Nearly all of these males are between 3mm and 6mm in length, and almost all were misidentified as *Pseudomethoca athamas* (Fox), *P. gila* (Blake), or *P. toumeyi* (Fox). These new species are described in the genus *Lomachaeta* below.

MATERIALS AND TERMINOLOGY

The following acronyms are used for institutions housing the material discussed in the current study:

CASC Department of Entomology, California Academy of Sciences, San Francisco, California, USA.

CDFA California State Collection of Arthropods, California Department of Food and Agriculture, Sacramento, California, USA.

CISC Essig Museum of Entomology, Department of Entomological Sciences, University of California, Berkeley, California, USA.

CNCI Canadian National Collection, Agriculture and Agri-Food Canada, Ottawa, Ontario, Canada.

EMUS Department of Biology Insect Collection, Utah State University, Logan, Utah, USA.

FSCA Florida State Collection of Arthropods, Division of Plant Industry, Gainesville, Florida, USA.

IAvH Instituto Alexander von Humboldt, Villa de Leyva, Colombia.

LACM Insect Collection, Los Angeles County Museum of Natural History, Los Angeles, California, USA.

UAIC Department of Entomology Collection, University of Arizona, Tucson, Arizona, USA.

UCDC The Bohart Museum of Entomology, University of California, Davis, California, USA.

UCRC UCR Entomological Teaching and Research Collection, University of California, Riverside, California, USA.

UMSP University of Minnesota Insect Collection, Department of Entomology, St. Paul, Minnesota, USA.

We have used the term "simple pubescence" for setae that are smooth and do not have barbed surfaces. "Brachyplumose pubescence" refers to setae with barbs that are less than or equal to the diameter of the shaft at the attachment of the barb. We have used the abbreviations T2, T3, etc., to denote the second, third, etc., metasomal

tergites while S2, S3, etc., denote the second, third, etc., metasomal sternites. Sparse punctures are separated by more than 2X the width of each puncture; moderately spaced punctures are separated by 1-2X the width of each puncture; dense punctures are separated by less than 0.5X the width of each puncture.

The illustrations in this manuscript were made using a camera lucida attached to a compound microscope at 100x magnification. Each illustration represents an internal-lateral view of the male genitalia, excluding the basal ring. To accomplish this, the genital capsule was first removed from each specimen using a narrow insect pin with an apical hook. Using this tool, in conjunction with a pair of fine-tipped forceps, the basal ring was removed, the lateral halves of the genitalia were separated, and the penis valve was removed. Lateral illustrations were made of the penis valve and remaining genital capsule. Because of the small size of these insects, some species may have short setae that were not observed in the illustration process. Finally, because of the angle of illustration, some figures appear to be less densely setose than the intact genitalia will appear in curated specimens.

Lomachaeta Mickel, 1936

Lomachaeta Mickel 1936: 289. Type species: *Lomachaeta hicksi* Mickel, by original designation.

Smicromutilla Mickel 1964: 108. Type species: *Smicromutilla powelli* Mickel, by original designation. **Syn. nov.**

Diagnosis.—Males of this genus can be separated from all other New World Mutillidae by the following unique combination of characters: the axillae are strongly dentate (Pitts and Manley 2004: Fig. 13); brachyplumose setae are present on the genae and pronotum; and the metasoma is subsessile or disciform, but never petiolate. Females of this genus possess the following combination of characters: the pygidium is undefined laterally and typically glabrous; the mesosoma is pyriform in shape, lacking lateral emargination anterior to propodeal spiracle; and the metasoma is narrow and either subsessile or disciform, but never broadly sessile or petiolate.

Distribution.—Throughout the Western Hemisphere, from Canada to Argentina

Remarks.—When Mickel (1964) first described *Smicromutilla*, he recognized its close relation to *Lomachaeta*. For males, *Smicromutilla* was separated from *Lomachaeta* by the absence of a ventral mandibular tooth, the absence of bristles on the margin of the second tergite, and the reduced wing venation. *Smicromutilla* females had the anterior and posterior spiracles unarmed, while those of *Lomachaeta* were tuberculate. Casal (1969) discovered female *Lomachaeta* from Argentina that had the propodeal spiracles tuberculate and the pronotal spiracles unarmed, displaying intermediate morphology between the known females of *Lomachaeta* and *Smicromutilla*. Pitts and Manley (2004) described five new male species of *Lomachaeta*; three of these species lack a ventral mandibular tooth, further blurring the line between *Lomachaeta* and *Smicromutilla*. Additionally, Pitts and Manley (2004) described one new *Smicromutilla* species that had normal wing venation. With the discovery of these species, the only characters that could be used to separate male *Smicromutilla* and *Lomachaeta* were the presence of bristles on T2 of *Lomachaeta* and the shape of the petiole, which is disciform in *Lomachaeta* and subsessile in *Smicromutilla* (Pitts and Manley 2004).

One specimen of *Lomachaeta ptilohyalus* Pitts & Manley from Yuma, Arizona lacks thickened bristles on the fringe of T2, although other known specimens of *L. ptilohyalus* have well-defined tergal bristles. Additionally, a new species (described here) from Mexico was discovered that has tergal bristles, like *Lomachaeta*, but a subsessile petiole, as in *Smicromutilla*. Because there are no consistent morphological

characters that can distinguish males of these two genera, and because it is doubtful that female morphology will provide generic-level characters given the limited number of differences known thus far, we consider *Smicromutilla* as a junior synonym of *Lomachaeta*.

Many of the new species were initially identified as *Pseudomethoca* Ashmead and, at first glance, can be easily confused with this genus. *Lomachaeta*, however, can easily be separated from *Pseudomethoca* by the dentate axillae (Pitts and Manley 2004: Fig. 13); *Pseudomethoca* have unarmed axillae. Because of the superficial similarity in appearance between these two genera, there are likely numerous specimens of *Lomachaeta* in the hastily sorted pseudomethocine material of many research collections.

Species-groups.—The males of *Lomachaeta* can be separated into two species groups based mainly on mandibular morphology: the *L. crocopinna* species-group, and the *L. hicksi* species-group.

The *L. hicksi* species-group is defined by the presence of a ventral mandibular tooth (as in Pitts et al. 2009: Fig. 46) and the presence of thickened, dark-brown or black bristles on the apical fringe of T2 (e.g. Fig. 19). The members of this species-group have fairly conserved genitalic morphology, but there is variation in the number of teeth on the penis valve (Pitts and Manley 2004: Figs 14–18). This species-group is found throughout North America, ranging from Massachusetts west to Oregon and south to Costa Rica. The species-group includes *L. chionothrix* Pitts & Manley, *L. cirrhomeris* Pitts & Manley, and *L. hicksi* Mickel.

The *L. crocopinna* species-group is defined by the lack of a ventral mandibular tooth. Most members of this species-group have only simple setae on the apical fringe of T2 and those with thickened bristles typically have pale yellow to orange-brown bristles. The members of this species-group have considerably different genitalic morphology, including differences in paramere shape and setae (Figs 1, 3, 5, 9, 11, 13, 15, and 17). This species-group ranges from California east to Texas and south to Argentina. Pitts and Manley (2004) had placed *L. hyphantria* into its own species-group based on differences in brachyplumose setae, mesonotal punctation, and setae of the parameres. We place the following 13 species into the *L. crocopinna* species-group, which is made up of: *L. beadugrimi* (Pitts & Manley), *L. crocopinna* Pitts & Manley, *L. hedera*, **sp. nov.**, *L. hyphantria* Pitts & Manley, *L. ilex*, **sp. nov.**, *L. litosisyra* **sp. nov.**, *L. megomicron*, **sp. nov.** *L. polemomechana*, **sp. nov.**, *L. powelli* (Mickel), *L. ptilohyalus* Pitts & Manley, *L. snellingella*, **sp. nov.**, *L. theresa*, **sp. nov.**, and *L. vacamuerta*, **sp. nov.** This is the largest and most morphologically variable species-group; future phylogenetic studies may recognize this group as paraphyletic.

Lomachaeta beadugrimi (Pitts & Manley, 2004), new combination

Smicromutilla beadugrimi Pitts & Manley 2004: 20. Holotype male: USA, California, San Bernardino Co., Granite Mts., 9.VI.1980, T. Griswold (EMUS). **Comb. nov.**

Diagnosis.—This species can be separated from all other *Lomachaeta* by the shape of the parameres, which are dorsoventrally flattened and rounded apically, and by the integument of T2, which is orange or red. The following characters are also useful for identification: the mandible is unarmed ventrally and the apical fringe of T2 lacks thickened bristles.

Genitalia: See Pitts and Manley (2004: 21, 26).

Length.—3–6 mm.

Female.—Unknown.

Host.—Unknown.

Material examined.—**USA:** CALIFORNIA: *San Bernardino Co.*: Kelbaker Road, 1 ♂, 17.May.2003, D. Yanega coll. (UCRC); Kelso Dunes Rd., 2 ♂, 17–18.May.2003, D. Yanega coll. (UCRC); Kramer Hills, 4 ♂, 14.May.2005. D. Yanega coll.

(UCRC); Lucerne Valley, vic., 1 ♂, 5.May.2001, G.R. Ballmer coll. (UCRC); 15 mi. NW of Yucca Valley, 1 ♂, collector and date unknown (UCRC).

Distribution.—California and Nevada.

Remarks.—This species has similar genitalia to *Lomachaeta snellingella*, **sp. nov.** (Fig. 13), but can easily be separated from it by the bright orange or red metasomal integument.

Lomachaeta chionothrix Pitts & Manley, 2004

Lomachaeta chionothrix Pitts & Manley 2004: 6. Holotype male: Guatemala, Zacapa, Rio Hondo, 7.VI.1987, collector unknown (CNCI).

Diagnosis.—This species can be separated from all other *Lomachaeta* by the following combination of characters: the mandible has a well-defined ventral tooth, the mesonotum is densely and deeply punctured, the legs are black, the apical fringe of T2 has thickened bristles (e.g. Fig. 19), and the penis valve of the genitalia is bidentate apically (see Pitts and Manley 2004: 26, fig. 14).

Genitalia: See Pitts and Manley (2004: 7, 24, 26).

Length.—3–6 mm.

Female.—Unknown.

Host.—Unknown.

Material examined.—**COSTA RICA:** GUANACASTE: 14 km S Cañas, EJN: F. D. Parker coll.: 2 ♂, 7–10.Mar.1989; 1 ♂, 20–24.Mar.1989; 1 ♂, Jan.1990; 1 ♂, 26–27.Jan.1990; 2 ♂, 1–3.Feb.1990; 2 ♂, 9–10.Feb.1990; 7 ♂, 12–15.Mar.1990; 1 ♂, 13–21.Mar.1990; 8 ♂, 15–18.Mar.1990; 2 ♂, 21–23.Mar.1990; 1 ♂, 25–26.Mar.1990; 2 ♂, 29–30.Mar.1990; 2 ♂, 1.Apr.1990; 1 ♂, 28–30.Nov.1990; 1 ♂, 7–9.Dec.1990; 1 ♂, 25.Dec.1990 (EMUS). **MEXICO:** JALISCO: Carayes, 17 ♂, 12.II. –19.Mar.1997, F.D. Parker coll. (EMUS); Chamela Research Station, 1 ♂, 6.Aug.1986, M. Sanchez coll. (EMUS).

Distribution.—Southern Mexico, Guatemala, and Costa Rica.

Remarks.—This is the first record of this species in Costa Rica. Additionally, the numerous specimens from Jalisco, Mexico suggest that the initial record from Nayarit, Mexico (Pitts and Manley 2004) is well within the range of this northern Neotropical species.

Lomachaeta hedera Williams & Pitts, new species
(Figs 1, 2)

Diagnosis.—This species can be separated from other male *Lomachaeta* species by the following combination of unique characters: the mandible is unarmed ventrally, T2 is black and lacks an apical fringe of thickened bristles, and the paramere has long setae ventrally in the apical half (Fig. 1).

Male holotype.—*Coloration*: Head, mesosoma, metasoma, and legs dark brown. Mandible reddish-brown, darkened basally and apically. Tegula brown. Tibial spurs white. Wings hyaline, veins brown. Ocellar area, mesonotum, and T5-7 clothed with interspersed white and brown erect setae; remaining setae white. *Head*: Rounded posteriorly. Front with deep dense punctures. Vertex with moderately spaced punctures. Mandible tridentate apically, unarmed ventrally. Clypeus densely punctate, rounded anteriorly. Antennal scrobe ecarinate. Gena weakly carinate. Ocelli minuscule; ocellocular distance 5X diameter of lateral ocellus, interocellar distance >3X lateral ocellar diameter. Flagellomere I 1.0X pedicel length; flagellomere II 1.7X pedicel length. *Mesosoma*: Pronotum with deep dense punctures dorsally, glabrous with sparse punctures laterally. Tegula glabrous, except margin setigerously punctate. Mesonotum with sparse punctures. Mesopleuron with deep dense punctures. Metapleuron glabrous. Scutellum slightly convex with deep dense punctures. Propodeum reticulate dorsally, glabrous laterally. *Metasoma*: T1 subsessile, with evenly rounded anterior and dorsal faces, punctures moderately spaced. T2 with deep moderately spaced punctures; S2 with deep, sparse punctures. T3-6 with small

moderately spaced punctures; S3-6 with small moderately spaced punctures. Pygidium with deep dense punctures. Hypopygidium with deep punctures, emarginate apically. *Genitalia* (Figs 1, 2): Paramere slightly laterally compressed, acuminate apically, and with long ventral setae along apical half. Penis valve unidentate apically.

Length.—4–5 mm.

Female.—Females collected at the same time and locality as the males are known, but we hesitate to describe them without additional evidence, because both *L. cirrhomeris* Pitts & Manley and *L. hicksi* Mickel have been collected in Baja California previously.

Host.—Unknown.

Type material.—***HOLOTYPE*: MEXICO:** BAJA CALIFORNIA SUR: Arroyo San Gregorio, 13 air km WNW La Purissima, ♂, 24–26.Apr.1983, M.S. Wasbauer coll. (CDFA). ***PARATYPES*: MEXICO:** BAJA CALIFORNIA SUR: Arroyo San Gregorio, 13 air km WNW La Purissima, 2 ♂, 24–26.Apr.1983, M.S. Wasbauer coll. (CDFA); Rancho Tablon, 13 km S Guillermo, 4 ♂, 16–18.Apr.1983, J. Slansky coll. (CDFA); Eastern edge of Sierra Placeres, 1 ♂, 24.Mar.1984, W.J. Pulawski coll. (CASC).

Distribution.—Baja California Sur, Mexico.

Etymology.—Named after JPP's daughter Ivy using the Latin name of the plant that is commonly called ivy (*Hedera*). Treat as a noun in apposition.

Remarks.—This species is morphologically similar to *L. ilex*, **sp. nov.**, and can be separated from that species by the setal pattern of the paramere (Figs 1, 3). Additionally, most specimens of *L. hedera* have black or dark brown tegulae, while all *L. ilex* specimens have orange or red tegulae. There is one specimen of *L. hedera*, however, with dark red tegulae, so the genitalia should also be used for identification.

The holotype and all of the paratypes were collected during March and April, suggesting that this species has spring seasonality.

Lomachaeta hyphantria Pitts & Manley, 2004

Lomachaeta hyphantria Pitts & Manley 2004: 11. Holotype male: Bolivia, Dep. Beni, Rio Itenez, 4 km above Costa Marque, Brazil, 12–18.Sep.1964, J.K. Bowseman and J. Lussenhop (AMNH).

Lomachaeta garm Williams & Pitts 2007: 299. Holotype male: **Colombia**, *Bolivar*, PNN Gorgona La Suiris, 2.Mar.2001-17.Mar.2001, coll. R Duque (IAvH). **Syn. nov.**

Diagnosis.—This species can be separated from all other *Lomachaeta* by the following combination of characters: the mandible is unarmed ventrally, the gena is carinate, the apical fringe of T2 has thickened brown bristles (e.g. Fig. 19), and the paramere is virtually asetose. *Genitalia*: See Pitts and Manley (2004: 12, 26) and Williams and Pitts (2007: 300, 326).

Length.—3–6 mm.

Female.—Unknown.

Host.—Unknown.

Material examined.—**BRAZIL:** RONDONIA: 62 km SE Ariquemas: 1 ♂, 22–31.Oct.1997, W.J. Hanson coll. (EMUS), 2 ♂, 1–14.Nov.1997, W.J. Hanson coll. (EMUS); Rio Guapore, opposite mouth of Rio Baures (Bolivia), 1 ♂, 26.Sep.1964, Bouseman & Lussenhop coll. (AMNH). **ECUADOR:** SUCUMBIOS: Rio Napo nr Sancha Lodge, 1 ♂, 12–22.May.1995, S. & J. Peck coll. (EMUS). **VENEZUELA:** ARAGUA: El Limon, 2 ♂, 26.Mar.1987, R. Miller & L.A. Stange coll. (FSCA).

Distribution.—Throughout northern South America: Colombia, Venezuela, Brazil, and Ecuador.

Remarks.—The holotype of this species has the integument of the head, mesosoma, and metasoma almost entirely dark brown. *Lomachaeta garm* Williams & Pitts was differentiated from *L. hyphantria* by differences in coloration, specifically in the orange head of *L. garm* (Williams and Pitts 2007). This was considered a valid distinction, because no intermediate color forms were recognized at the time, and the

specimens were widely separated geographically, with *L. garm* occurring in a lowland forest in northern Colombia, and *L. hyphantria* occurring in the southern Amazon Basin in Rondonia, Brazil and Beni, Bolivia.

Closer examination of specimens incorrectly identified as *Pseudomethoca* yielded additional South American *Lomachaeta*. These specimens were collected in rainforest habitats in Brazil, Ecuador, and Venezuela. In each of these specimens there is some level of orange integument on the head. One specimen from near Ariquemas, Brazil and the specimen from Ecuador have orange coloration restricted to a narrow ring around the eyes. The other two specimens from near Ariquemas, Brazil and the two specimens from Venezuela have more extensive orange coloration, with orange rings around the eyes and with the entire front orange as well. Discovery of new localities and these intermediate color forms is strong evidence that *L. garm* is simply a color variant of *L. hyphantria*. We, therefore, consider *L. garm* as a junior synonym of *L. hyphantria*.

This is one of the most widely distributed *Lomachaeta* species, potentially ranging throughout the northern forested regions of South America.

Lomachaeta ilex Williams & Pitts, new species

(Figs 3, 4)

Diagnosis.—This species can be separated from other male *Lomachaeta* species by the following unique combination of characters: the mandible is unarmed ventrally, the tegulae are red, T2 is black and lacks an apical fringe of thickened bristles, and the paramere has a long setae ventrally throughout its free length (Fig. 3).

Male holotype.—Coloration: Head and mesosoma black, metasoma and legs dark brown. Mandible orange, darkened basally and apically. Tegula pale orange. Tibial spurs white. Wings hyaline, veins brown. Ocellar area, mesonotum, and T6-7 clothed with interspersed white and brown erect setae; remaining setae white. *Head*: Rounded posteriorly. Front with deep dense punctures. Vertex with moderately spaced punctures. Mandible tridentate apically, unarmed ventrally. Antennal scrobe ecarinate. Gena ecarinate. Ocelli minuscule; ocellocular distance >5X length of lateral ocellus, interocellar distance 3X lateral ocellar length. Flagellomere I 0.9X pedicel length; flagellomere II 1.5X pedicel length. *Mesosoma*: Pronotum with dense punctures dorsally, glabrous with sparse punctures laterally. Tegula glabrous, except margin setigerously punctate. Mesonotum with deep sparse punctures. Mesopleuron with dense punctures. Metapleuron glabrous. Scutellum slightly convex, with deep dense punctures. Propodeum reticulate dorsally, glabrous laterally. *Metasoma*: T1 subsessile, with evenly rounded anterior and dorsal faces, punctures moderately spaced. T2 with deep sparse punctures; S2 with sparse punctures. T3-6 with small moderately spaced punctures; S3-6 with small moderately spaced punctures. Pygidium punctate, shagreened between punctures. Hypopygidium with deep punctures, emarginate apically. *Genitalia* (Figs 3, 4): Parameres slightly laterally flattened, acuminate apically, and with long ventral setae throughout free length of paramere. Penis valve unidentate apically.

Length.—4–5 mm.

Female.—Unknown.

Host.—Unknown.

Type material.—***HOLOTYPE*: USA:** NEVADA: South of Kaolin Wash, male, 22.May.1998, C. Schulz, K. Receveur, K. Keene, M. Andrus coll. (EMUS). ***PARATYPES***: CALIFORNIA: *Imperial Co.*: Palo Verde, 1 ♂, 1.Apr.1968, R.M. Bohart coll. (UCDC); *San Bernardino Co.*: Cronise Valley, 1 ♂, 29.Apr.1956, M.S. Wasbauer coll. (CISC); Kelso Dunes Road, 1 ♂, 17–18.May.2003, D. Yanega coll. (UCRC); *San Diego Co.*: Borrego Valley: 4 ♂, 18.Apr.1957, R.M. Bohart coll. (UCDC, EMUS); 1 ♂, 18.Apr.1957, R.W. Bushing coll. (UCDC); 2 ♂, 19.Apr.1957, R.M. Bohart coll.

(UCDC); 1 ♂, 6.Apr.1964, F.D. Parker coll. (DGMC); NEVADA: *Clark Co.*: 4.5 mi SW Boulder, 2 ♂, 17.Sep.1997, Andrus, Griswold & Messinger coll. (EMUS); E of Logandale, 2 ♂, 20.May.1998, C. Schulz & K. Keen coll. (EMUS); Mormon Mesa, 1 ♂, 20.May.1998, C. Schulz, K. Receveur, K. Keene, M. Andrus coll. (EMUS); Toquop Wash, 1 mi N of Highway I-15, 1 ♂, 25.May.2003, G.R. Ballimer coll. (UCRC).

Distribution.—Mojave and western Sonoran Deserts in California and Nevada.

Etymology.—Named after JPP's daughter Holly using the Latin name of the plant that is commonly called holly (*Ilex*). Treat as a noun in apposition.

Remarks.—This species is morphologically similar to *L. hedera,* **sp. nov.**, and can be separated from that species by the setal pattern of the paramere (Figs 1, 3). All specimens of *L. ilex* have orange or red tegulae; while most specimens of *L. hedera* have black or dark brown tegulae. There is one specimen of *L. hedera*, however, with dark red tegulae, so the genitalia should be used for identification.

The holotype and all of the paratypes were collected during April, May, or September, suggesting that this species has spring and fall seasonality.

Lomachaeta litosisyra Williams & Pitts, new species
(Figs 5, 6)

Diagnosis.—This species can be separated from all other male *Lomachaeta* species by the shape of the paramere, which is cylindrical, down-curving apically, and has an apical tuft of long setae. The following characters are also useful for identification: the mandible is unarmed ventrally, T2 is black and lacks an apical fringe of thickened bristles, and the tegulae are red.

Male holotype.—Coloration: Head, mesosoma, and metasomal segments 1-6 black. Mandible dark orange, darkened basally and apically. Tegulae red. Legs brown, femora darkened. Tibial spurs white. Metasomal segment 7 orange-brown apically. Wings hyaline, veins brown. Ocellar area, mesonotum, and T4-7 clothed with interspersed white and brown erect setae; remaining setae white. *Head*: Rounded posteriorly. Front deeply densely punctate. Vertex with deep, moderately spaced punctures. Mandible tridentate apically, unarmed ventrally. Antennal scrobe ecarinate. Gena ecarinate. Ocelli minuscule; ocellocular distance >6X length of lateral ocellus, interocellar distance >4X lateral ocellar length. Flagellomere I 0.9X pedicel length; flagellomere II 1.2X pedicel length. *Mesosoma*: Pronotum with moderately spaced punctures dorsally, glabrous with sparse punctures laterally. Tegula glabrous, except margin setigerously punctate. Mesonotum with deep, moderately spaced punctures. Mesopleuron with deep dense punctures. Metapleuron glabrous. Scutellum slightly convex, with deep dense punctures. Propodeum reticulate dorsally, glabrous laterally. *Metasoma*: T1 subsessile, with evenly rounded anterior and dorsal faces, punctures deep and dense. T2 with deep, moderately spaced punctures; S2 with deep, moderately spaced punctures. T3-6 with moderately spaced punctures; S3-6 with small dense punctures. Pygidium punctate. Hypopygidium punctate, emarginate apically. *Genitalia* (Figs 5, 6): Parameres elongate, cylindrical, down-curving apically, and with apical tuft of long setae. Penis valve unidentate apically.

Length.—4–6 mm.

Female.—Unknown.

Host.—Unknown.

Type material.—***HOLOTYPE*: USA:** ARIZONA: *Santa Cruz Co.*: 12 km E Arivaca, ♂, 3–7.May.2004, M.E. Irwin & F.D. Parker coll. (EMUS). ***PARATYPES*: MEXICO:** SONORA: San Carlos, 1 ♂, 3.Sep.1970, G.E. & R.M. Bohart coll. (EMUS). **USA:** ARIZONA: *Pima Co.*: Ina, Oracle, vic. Tucson, 1 ♂, 7.Sep.1987, W.L. Nutting coll. (UAIC); Silver Reef Wash, 4 km E VaivaVo Tat Monoii Mountains, 2 ♂, 1–7.May.2006, M.E. Irwin coll. (EMUS); Tucson, 1 ♂, 30.Jul.1979, F.G. Werner coll. (UAIC); Vail Mountain Creek Wash, 1 ♂, 18–25.Apr.2006,

M.E. Irwin coll. (EMUS); *Santa Cruz Co.*: 5 mi. W of Arivaca Junction, 1 ♂, 2.Apr.1986, T. Griswold coll. (EMUS).

Distribution.—Southern Arizona and northern Sonora, Mexico.

Etymology.—From the Greek *litos* "simple" and *sisyra* "garment", in reference to the dull gray setae covering the insect.

Remarks.—The apical tuft of setae on the paramere of this species is similar to that of *L. vacamuerte*, **sp. nov.** (Fig. 17), and where these species co-occur they share similar coloration, most notably, the tegulae are red. To identify this species, full extraction of the genitalia is often necessary in order to recognize the down-curved paramere shape, which is distinctive of *L. litosisyra*, **sp. nov.** (Fig. 5).

Lomachaeta megomicron Williams & Pitts, new species
(Figs 7, 8)

Diagnosis.—This species can be separated from all other *Lomachaeta* species by the following combination of characters: the mandible is unarmed ventrally, the gena is weakly carinate, the apical fringe of T2 has thickened brown bristles (e.g. Fig. 19), and the paramere has an apical tuft of setae (Fig. 7).

Male holotype.—Coloration: Head, mesosoma, metasomal segments 1-6 black, except apical band of T1 hyaline. Mandible orange, darkened basally and apically. Tegulae brown. Coxae and femora dark brown, tibiae and tarsi orange-brown. Tibial spurs white. Wings slightly infuscated, veins brown. Ocellar area, mesonotum, and T2 clothed with interspersed white, golden, and brown erect setae; remaining setae white. Fringes of T2-4 each having row of pale golden bristles in addition to simple setae. *Head*: Rounded posteriorly. Head contiguously punctate throughout, nearly reticulate. Mandible tridentate apically, unarmed ventrally. Antennal scrobe ecarinate. Gena weakly carinate. Ocelli small; ocellocular distance 4X length of lateral ocellus, interocellar distance 1.8X lateral ocellar length. Flagellomere I equal to pedicel length; flagellomere II 1.2X pedicel length. *Mesosoma*: Pronotum with coarse contiguous punctures dorsally, glabrous with sparse punctures laterally. Tegula glabrous, except margin setigerously punctate. Mesonotum with large, closely spaced punctures. Mesopleuron contiguously punctate. Metapleuron glabrous. Scutellum slightly convex with deep, dense punctures. Propodeum reticulate dorsally, glabrous laterally. *Metasoma*: T1 disciform, punctures moderately spaced. T2 with deep, dense punctures; S2 with deep, moderately spaced punctures. T3-6 with medium, dense punctures; S3-6 with small, dense punctures. Pygidium punctate. Hypopygidium with deep punctures, emarginate apically. *Genitalia* (Figs 7, 8): Parameres cylindrical, acuminate apically, and with apical tuft of setae. Penis valve unidentate apically.

Length.—4–6 mm.

Female.—Unknown.

Host.—Unknown.

Type material.—***HOLOTYPE*: ARGENTINA:** SALTA: 8 km N La Viña, ♂, 26.Oct.–13.Nov.2003, M.E. Irwin & F.D. Parker coll. (EMUS). ***PARATYPES*: ARGENTINA:** CATAMARCA: San Pablo, 6 ♂, 24.Oct.–12.Nov.2003, M.E. Irwin & F.D. Parker coll. (EMUS); SALTA: 8 km N La Viña, 3 ♂, 26.Oct.–13.Nov.2003, M.E. Irwin & F.D. Parker coll. (EMUS).

Distribution.—Argentina: Salta and Catamarca Provinces.

Etymology.—From the Greek *"mega"*, meaning large, and the fifteenth Greek letter *"Omicron"*, which resembles the Latin letter "O", in reference to the large, nearly circular eyes.

Remarks.—This male is likely conspecific with either *L. viani* Casal or *L. ibarrai* Casal, which both occur in Argentina and were described from females only (Casal 1969).

This species appears most closely related to *L. hyphantria*, the only other male species known from South America, because both species possess a genal carina, although the genal carina of *L. megomicron*, **sp. nov.**, is

much less developed than that of *L. hyphantria*.

Lomachaeta polemomechana Williams & Pitts, new species
(Figs 9, 10)

Diagnosis.—*Lomachaeta polemomechana*, **sp. nov.**, can be separated from other males by the following combination of characters: the mandible is unarmed ventrally, T2 lacks a row of thickened bristles, and the parameres are aciculate apically and lack long setae, instead only having setae that are shorter than the width of each paramere (Fig. 9).

Male holotype.—*Coloration:* Head, mesosoma, metasoma, and legs black. Mandible orange-brown, darkened basally and apically. Tegulae brown. Tibial spurs white. Wings hyaline, veins brown. Ocellar area, mesonotum, and T5-7 clothed with interspersed white and brown erect setae; remaining setae white. *Head*: Rounded posteriorly. Front deeply confluently punctate. Vertex with deep, moderately spaced punctures. Mandible tridentate apically, unarmed ventrally. Antennal scrobe ecarinate. Gena weakly carinate. Ocelli minuscule; ocellocular distance >5X length of lateral ocellus, interocellar distance 4X lateral ocellar length. Flagellomere I 1.0X pedicel length; flagellomere II 1.4X pedicel length. *Mesosoma*: Pronotum with deep dense punctures dorsally, glabrous with sparse punctures laterally. Tegula glabrous, except margin setigerously punctate. Mesonotum with deep, sparse punctures. Mesopleuron with deep confluent punctures. Metapleuron glabrous. Scutellum slightly convex, with deep confluent punctures. Propodeum reticulate dorsally, glabrous laterally. *Metasoma*: T1 weakly disciform, with deep confluent punctures. T2 with deep, moderately spaced punctures; S2 with deep, moderately spaced punctures, slightly larger than those on T2. T3-6 with small sparse punctures; S3-6 with small sparse punctures. Pygidium punctate, granulate between punctures. Hypopygidium with deep punctures, emarginate apically. *Genitalia* (Figs 9, 10): Parameres slightly laterally flattened, acuminate apically, and clothed exclusively with short setae that are scattered throughout the free length. Penis valve unidentate apically.

Length.—4–6 mm.

Female.—Unknown.

Host.—Unknown.

Type material.—***HOLOTYPE*: MEXICO:** SONORA: 30 km E Agua Prieta, ♂, 19.Aug.2001, R.E. Minckley coll. (EMUS). ***PARATYPES*: USA:** ARIZONA: *Cochise Co.*: Paradise Rd., 3 mi. W Portal, 1 ♂, 26–28.Jul.2006, K.A. Williams & J.S. Wilson coll. (EMUS); *Pima Co.*: Baboquivari Mountains, Brown Canyon, 1 ♂, 16.Jun.2000, C.A. Olson & K. Will coll. (UAIC); *Santa Cruz Co.*: Ruby Mt., 20 km SSE Arivaca, 2 ♂, 3–7.May.2004, M.E. Irwin & F.D. Parker coll. (EMUS).

Distribution.—Southern Arizona and northern Sonora, Mexico.

Etymology.—From the Greek *polemikos* "warlike" and *mechanos* "machine".

Remarks.—The paramere of this species is similar to that of *L. chionothrix* Pitts & Manley, *L. cirrhomeris* Pitts & Manley, and *L. hicksi* Mickel, in that all of the setae are shorter than the paramere width. Each of those species has a well-developed ventral mandibular tooth, while *L. polemomechana*, **sp. nov.**, lacks a ventral tooth. Additionally, *L. cirrhomeris*, *L. chionothrix*, and *L. hicksi* each have thickened bristles at the apex of T2, while *L. polemomechana* has simple setae only on T2.

Lomachaeta powelli Mickel, 1964, new combination
(Figs 11, 12)

Smicromutilla powelli Mickel 1964: 108, 1 fig. male female, holotype male: USA, California, San Luis Obispo Co., 30.Apr.1962, J. Powell (CISC). **Comb. nov.**

Diagnosis of male.—This species can be separated from other male *Lomachaeta* by

the drastically reduced wing venation. The following characters are also useful for identification: the mandible is unarmed ventrally, the tegulae are orange or red, the integument of T2 is orange or red, the apical fringe of T2 lacks thickened bristles, and the paramere is virtually straight, aciculate apically, and lacks long setae.

Description of male genitalia (Figs 11, 12): Parameres slightly laterally flattened, acuminate apically, and clothed only with sparse, short setae. Penis valve unidentate apically.

Length.—3–6 mm.

Host.—The type specimens were collected crawling among a ground-nesting aggregation of *Diodontus occidentalis* Fox. This is an interesting, yet somewhat dubious, host record, in that all other *Lomachaeta* have been reared from twig- or mud-nesting crabronid wasps.

Material examined.—**USA:** CALIFORNIA: Sacramento Co.: Carmichael, 1 ♂, 16.Jun.1966, R.F. Wilkey coll. (UMSP).

Distribution.—Central Valley and Coast Range of California.

Remarks.—This is the type species of *Smicromutilla* Mickel. The genitalia of *L. powelli* (Mickel) have not been illustrated in the previous literature. The genitalic morphology is similar to that of other *Lomachaeta*, including the type species, *L. hicksi* Mickel.

Lomachaeta ptilohyalus Pitts & Manley, 2004

Lomachaeta ptilohyalus Pitts & Manley 2004: 12. Holotype male: Mexico, Oaxaca, 10 m North of Huajuapan de Leon, 7.Mar.1985, L. Stange & R. Miller (CNCI).

Diagnosis.—This species can be separated from all other *Lomachaeta* by the following combination of characters: the mandible is unarmed ventrally, the pronotum and mesonotum are sparsely punctate, the integument of metasomal segments 2 and 3 is red or orange, and the paramere is acuminate apically with long setae ventrally.

Genitalia: See Pitts and Manley (2004: 13, 26).

Length.—4–6 mm.

Female.—Unknown.

Host.—*Solierella plenoculoides similis.*

Material examined.—**USA:** ARIZONA: *Yuma Co.*: Yuma Proving Grounds, 1 ♂, 27.Jun.2001, S.L. Buchmann coll. (EMUS); Yuma Proving Grounds, site 531.3, 1 ♂, 26.May.2001, S.L. Buchmann coll. (EMUS).

Distribution.—Arizona and California in the United States and Oaxaca, Mexico.

Remarks.—The specimens from Arizona are identical to the previously recorded specimens of *L. ptilohyalus*, except that the apical setae of T2 are simple and pale yellow, rather than thickened orange bristles.

Lomachaeta snellingella Williams & Pitts, new species

(Figs 13, 14)

Diagnosis.—This species can be separated from all other *Lomachaeta* by the black metasomal integument and the shape of the parameres, which are dorsoventrally flattened and rounded apically (Fig. 13). Additionally, this species has the mandibles unarmed ventrally and lacks thickened bristles on the apex of T2.

Male holotype.—*Coloration:* Head, mesosoma, metasoma and legs dark brown. Mandible orange, darkened basally and apically. Tegula brown. Tibial spurs white. Wings hyaline, veins brown. Ocellar area, mesonotum, and T6-7 clothed with interspersed white and brown erect setae; remaining setae white. *Head*: Rounded posteriorly. Front with moderately spaced to dense punctures. Vertex with moderately spaced punctures. Mandible tridentate apically, unarmed ventrally. Antennal scrobe ecarinate. Gena ecarinate. Ocelli minuscule; ocellocular distance 5X length of lateral ocellus, interocellar distance >3X lateral ocellar length. Flagellomere I 1.0X pedicel length; flagellomere II 1.5X pedicel length. *Mesosoma*: Pronotum with moder-

ately spaced punctures dorsally, glabrous with sparse punctures laterally. Tegula glabrous, except margin setigerously punctate. Mesonotum with moderately spaced punctures. Mesopleuron with moderately spaced punctures. Metapleuron glabrous. Scutellum slightly convex, with deep moderately spaced punctures. Propodeum reticulate dorsally, glabrous laterally. *Metasoma*: T1 subsessile, with evenly rounded anterior and dorsal faces, punctures moderately spaced. T2 with shallow moderately spaced punctures; S2 with deep, moderately spaced punctures. T3-6 with sparse punctures; S3-6 with moderately spaced punctures. Pygidium punctate. Hypopygidium punctate, emarginate apically. *Genitalia* (Figs 13, 14): Parameres lamellate with apex evenly rounded, dorsoventrally flattened, down-curved apically, and with sparse, short setae along the internal and external surfaces. Penis valve unidentate apically.

Length.—3–5 mm.

Female.—Unknown.

Host.—Unknown.

Type material.—***HOLOTYPE*: USA:** CALIFORNIA: *San Diego Co.*: Borrego Valley, ♂, 19.Apr.1957, R.M. Bohart coll. (UCDC). ***PARATYPES*: USA:** CALIFORNIA: *Riverside Co.*: Deep Canyon Reserve, 3.5 km S Palm Desert, 1 ♂, 21.Apr.1973, K.L. Andrews coll. (UCRC); Thousand Palms: 1 ♂, 3.Apr.1955, W.R. Richards coll. (DGMC); 1 ♂, 11.Apr.1970, R.M. Bohart coll. (UCDC); Thousand Palms Canyon, 2 ♂, 8.Apr.1969, E. Grissel coll. (UCDC); *San Diego Co.*: Borrego, 1 ♂, 30.Apr.1957, F.X. Williams coll. (CASC).

Distribution.—Western Sonoran Desert in southern California.

Etymology.—We are proud to name this species after the late Dr. Roy Snelling, in honor of his outstanding research on aculeate Hymenoptera.

Remarks.—The genitalia are similar to those of *L. beadugrimi* (Pitts & Manley). These two species can be separated by the metasomal coloration, orange in *L. beadugrimi* and black to dark brown in *L. snellingella*. Because a similar range of coloration has been noted in widespread individual *Lomachaeta* species (e.g., *L. hicksi*), it is possible that *L. snellingella* may prove to be synonymous with *L. beadugrimi*. None of the recognized specimens of *L. beadugrimi* or *L. snellingella*, however, show any trace of intermediate coloration. Because of this, we choose to describe *L. snellingella* as a discrete species.

All known specimens of *L. snellingella* have been collected in April, suggesting spring seasonality.

Lomachaeta theresa Williams & Pitts, new species
(Figs 15, 16)

Diagnosis.—This species can be separated from all other *Lomachaeta* by the following combination of characters: the mandible is unarmed ventrally, the gena lacks a ventral carina, the metasoma is concolorous with the head and mesosoma, and the apical fringe of T2 has thickened brown bristles (e.g. Fig. 19). The paramere is also diagnostic, in having long ventrally directed setae on the external margin of the basal 0.75X of the free length.

Male holotype.—Coloration: Head, mesosoma, and metasoma black; apical fringes of T2-7 brown. Mandible orange, darkened basally and apically. Legs brown, femora darker than trochanters, tibiae and tarsi. Tegula brown. Tibial spurs white. Wings hyaline, veins brown. Ocellar area, mesonotum, and T4-7 clothed with interspersed white and brown erect setae; remaining setae white. *Head*: Rounded posteriorly. Front with deep confluent punctures. Vertex with moderately spaced punctures. Mandible tridentate apically, unarmed ventrally. Antennal scrobes ecarinate. Genae ecarinate. Ocelli small; ocellocular distance >4X length of lateral ocellus, interocellar distance >2X lateral ocellar length. Flagellomere I 0.9X pedicel length; flagellomere II 1.2X pedicel length. *Mesosoma*: Pronotum with deep moderately

spaced punctures dorsally, glabrous with sparse punctures laterally. Tegula glabrous, except margin setigerously punctate. Mesonotum with sparse punctures. Mesopleuron reticulate. Metapleuron glabrous. Scutellum slightly convex, with deep punctures. Propodeum reticulate dorsally, glabrous laterally. *Metasoma*: T1 subsessile, punctures moderately spaced. T2 with small moderately spaced punctures; S2 with deep, moderately spaced punctures. T3-6 with small moderately spaced punctures; S3-6 with dense punctures. Pygidium punctate. Hypopygidium with deep punctures, emarginate apically. *Genitalia* (Figs 15, 16): Parameres slightly laterally flattened, acuminate apically, with scattered long downward pointing setae on external margin in basal 0.75X free length of paramere. Penis valve unidentate apically.

Length.—5–6 mm.

Female.—Unknown.

Host.—Unknown.

Type material.—***HOLOTYPE*: MEXICO:** SONORA: 42 km ENE Alamos, Rancho Las Encinitas, ♂, 28–31.Jun.2007, M.E. Irwin coll. (EMUS). ***PARATYPES*: MEXICO:** SONORA: 43 km E Alamos, Rancho San Pablo, 1 ♂, 1–5.Jun.2007, M.E. Irwin coll. (EMUS); La Posa, 1 ♂, 1–5.Jun.2007, M.E. Irwin coll. (EMUS).

Distribution.—Currently known only from Sonora, Mexico.

Etymology.—Named in honor of JPP's wife Theresa Pitts-Singer. Treat as a noun in apposition.

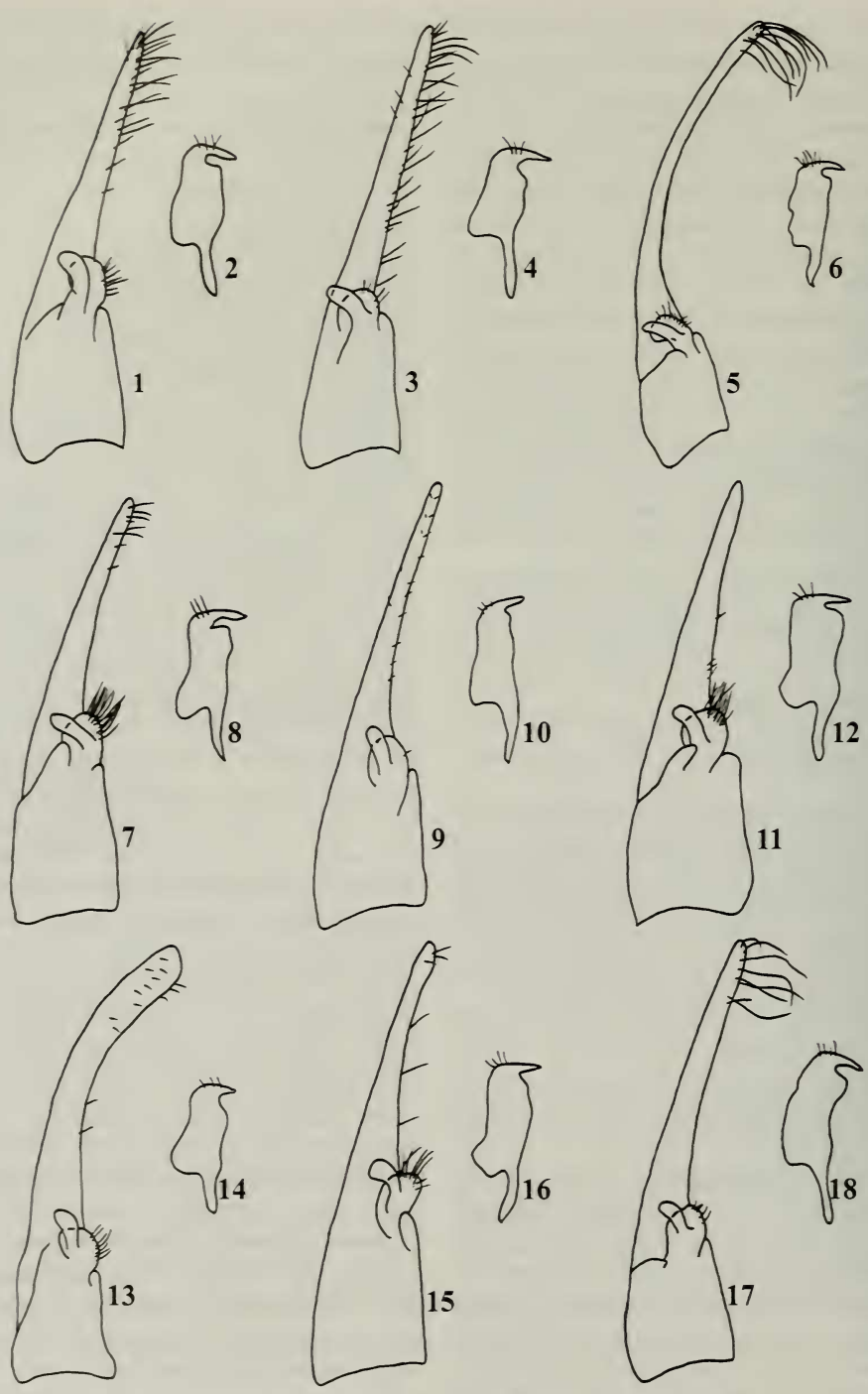
Remarks.—This species, *L. crocopinna* Manley & Pitts, and *L. ptilohyalus* Manley & Pitts are the only three North American *Lomachaeta* that have thickened bristles on the apex of T2, but lack a ventral mandibular tooth. *Lomachaeta theresa* can easily be separated from *L. crocopinna* and *L. ptilohyalus* by the black integument of T2 (T2 orange in *L. crocopinna* and *L. ptilohyalus*).

This species has the paramere more densely setose than the figure suggests, because the figure was drawn from the interal-lateral view (Fig. 15). There are numerous long setae along the external margin of the basal 0.75X of the paramere.

Lomachaeta vacamuerta Williams & Pitts, new species
(Figs 17, 18)

Diagnosis.—This species can be separated from all other *Lomachaeta* species by the following combination of characters: the mandible is unarmed ventrally, T2 is black and lacks an apical fringe of thickened bristles, and the paramere is virtually straight dorso-ventrally and has an apical tuft of long setae (Fig. 17).

Male holotype.—Coloration: Head, mesosoma, metasoma, and legs except tarsi black. Mandible black, orange-brown subapically. Tegula black. Tarsi brown. Tibial spurs white. Wings hyaline, veins brown. Ocellar area, mesonotum, and T4-7 clothed with interspersed white and brown erect setae; remaining setae white. *Head*: Rounded posteriorly. Front deeply confluently punctate. Vertex deeply densely punctate. Mandible tridentate apically, unarmed ventrally. Antennal scrobe ecarinate. Gena weakly carinate. Ocelli minuscule; ocellocular distance >5X length of lateral ocellus, interocellar distance 3X lateral ocellar length. Flagellomere I 1.0X pedicel length; flagellomere II 1.4X pedicel length. *Mesosoma*: Pronotum with deep dense punctures dorsally, glabrous with sparse punctures laterally. Tegula glabrous, except margin setigerously punctate. Mesonotum with deep sparse punctures. Mesopleuron with deep confluent punctures, metapleuron glabrous. Scutellum nearly flat, slightly convex, with deep, confluent punctures. Propodeum reticulate dorsally, glabrous laterally. *Metasoma*: T1 subsessile, with dense confluent punctures. T2 with deep, moderately spaced punctures; S2 with deep, moderately spaced punctures, slightly larger than those on T2. T3-6 with small moderately spaced punctures; S3-6 with dense punctures. Pygidium punctate. Hypopygidium punctate, emarginate



Figs 1–18. Male genitalia: lateral view, and penis valve. Figs 1–2: *Lomachaeta hedera*, **sp. nov.**; Figs 3–4: *L. ilex*, **sp. nov.**; Figs 5–6: *L. litosisyra*, **sp. nov.**; Figs 7–8: *L. megomicron*, **sp. nov.**; Figs 9–10: *L. polemomechana*, **sp. nov.**; Figs 11–12: *L. powelli*; Figs 13–14: *L. snellingella*, **sp. nov.**; Figs 15–16: *L. theresa*, **sp. nov.**; Figs 17–18: *L. vacamuerta*, **sp. nov.**

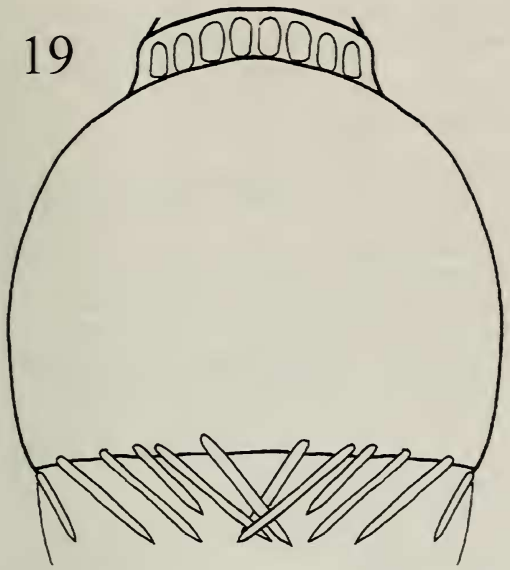


Fig. 19. Apical fringe of T2. Fig. 19: *Lomachaeta hicksi*, Mickel, reproduced from Pitts and Manley (2004) with permission from the authors.

apically. *Genitalia* (Figs 17, 18): Parameres cylindrical, weakly acuminate apically, with an apical tuft of long setae. Penis valve unidentate apically.

Length.—5–6 mm.

Female.—Unknown.

Host.—Unknown.

Type material.—***HOLOTYPE*: USA:** NEW MEXICO: *Chaves Co.*, Sagebrush Valley Road at Squaw Valley Road, ♂, 1–10.May.2004, M.E. Irwin coll. (EMUS); ***PARATYPES*: MEXICO:** SONORA: 28 km E Agua Prieta, 1 ♂, 22.Jun.2001, R.L. Minckley coll. (EMUS); 30 km E Agua Prieta, 1 ♂, 15.Apr.2001, R.L. Minckley coll. (EMUS). **USA:** ARIZONA: *Pima Co.*: Organ Pipe National Monument vic.: 3 ♂, 22.Apr.–2.May.2006, M.E. Irwin coll. (EMUS), 1 ♂, 2–12.May.2006, M.E. Irwin coll. (EMUS); Silver Reef Wash, 4 km E VaivaVo Tat Monoii Mountains, 17 ♂, 1–7.May.2006, M.E. Irwin coll. (EMUS); CALIFORNIA: *San Bernardino Co.*: Sheep Creek, 7.5 km NNE Wrightwood, 1 ♂, 25–30.May.2005, M.E. Irwin coll. (EMUS); NEW MEXICO: *Chaves Co.*, Sagebrush Valley Road at Squaw Valley Road, 15 ♂, 1–10.May.2004, M.E. Irwin coll. (EMUS); TEXAS: *Dimmit Co.*: 1.5 mi N Catarina, 1 ♂, 27.Apr.1985, W.J. Pulawski coll. (CASC); *Jeff Davis Co.*: Fort Davis, Point Rocks, 2 ♂, 30.May.1959, W.R.M. Mason coll. (CNCI); Davis Mountains Resort, 1 ♂, 16.May.–8.Jun.1998, D.G. Marqua coll. (LACM); *Kimble Co.*: Junction, 3 ♂, 6.May.1986, W.J. Pulawski coll. (CASC).

Distribution.—Arizona to Texas and Sonora, Mexico.

Etymology.—From the Spanish *vaca* "cow" and *muerte* "dead" in reference to a mistranslation of Cow Killer, an American common name for Mutillidae, and named in honor of Edmund E. Williams.

Remarks.—This is one of the most widely distributed *Lomachaeta* species, being found in all three hot Nearctic deserts (Chihuahuan, Mojave, and Sonoran) and in the mountainous Madrean Archipelago of southeastern Arizona. There is variation in coloration of the tegulae in this species; specimens from New Mexico and Texas have dark brown or black tegulae, while those from Arizona, California, and Sonora have reddish tegulae.

KEY TO MALES OF *LOMACHAETA*

1. Mandible having deep ventral excision with large ventral tooth (as in Pitts et al., 2009: Fig. 46) ..... 2 (*L. hicksi* species-group).
   Mandible weakly excised ventrally, lacking tooth .... 4 (*L. crocopinna* species-group).
2. Femora and tegulae orange brown or yellow brown, not concolorous with mesosoma ..... ***L. cirrhomeris* Pitts & Manley**
   Legs and tegulae black or dark brown, concolorous with mesosoma ..... 3.
3. Penis valve with one ventral tooth (see Pitts and Manley 2004: 26, Figs 16–18); mesonotal punctures sparsely spaced; integument of T2 often red or orange, at least laterally (Widespread in the Nearctic Region) ..... ***L. hicksi* Mickel**

Penis valve with two ventral teeth (see Pitts and Manley 2004: 26, fig. 14); mesonotal punctures closely spaced; integument entirely black (Costa Rica, Guatemala, and southern Mexico) ..... ***L. chionothrix* Pitts & Manley**

4. Metasoma orange to red, at least in part ..... 5.
Metasoma dark brown to black, concolorous with mesosoma ..... 8.

5. Paramere broadly flattened, rounded apically (as in Fig. 13) ..... ***L. beadugrimi* (Pitts & Manley)**
Paramere cylindrical, acuminate apically (e.g. Fig. 11) ..... 6.

6. Wing venation greatly reduced; paramere lacking long setae (Fig. 11) ... *L. powelli* (Mickel)
Wing venation normal; paramere having elongate setae ventrally (as in Fig. 3) ..... 7.

7. Punctures on pronotum and mesonotum more than 2 diameters apart; only metasomal segments 2 and 3 orange, sometimes middle of third tergite black brown (Arizona, California, and Mexico) ..... ***L. ptilohyalus* Pitts & Manley**
Punctures on pronotum and mesonotum less than 2 diameters apart; metasoma orange, except metasomal sternum 1 black brown (southwestern United States) ..... ***L. crocopinna* Pitts & Manley**

8. Apical fringe of T2 having thickened bristles apically (e.g. Fig. 19) ..... 9.
Apical fringe of T2 having simple setae only ..... 11.

9. Vertex having moderately spaced punctures; paramere having long setae on external surface of basal 0.75X of free length (Sonora, Mexico) ..... ***L. theresa* sp. nov.**
Front and vertex contiguously punctate, verging on reticulate, sometimes indistinct; paramere lacking long setae basally (South America) ..... 10.

10. Gena weakly carinate; apex of paramere having weak tuft of long setae (Argentina; Fig. 7) ..... ***L. megomicron* sp.nov.**
Genal carina well-defined, distinct; paramere lacking apical tuft (northern South America; as in Fig. 9) ..... ***L. hyphantria* Pitts & Manley**

11. Parameres flattened, rounded apically (Fig. 13) ..... ***L. snellingella* sp. nov.**
Parameres cylindrical or aciculate (Figs 1, 3, 5, 9, 17) ..... 12.

12. Paramere lacking long setae, all setae shorter than paramere width (Fig. 9) ..... ***L. polemomechana* sp. nov.**
Paramere having long setae ventrally, some setae longer than paramere width (Figs 1, 3) ..... 13.

13. Long ventral setae present throughout length of paramere (Fig. 3) (Mojave & Western Sonoran Deserts) ..... ***L. ilex* sp. nov.**
Paramere lacking long setae basally, either having apical tuft of setae (Figs 5, 17) or having long setae ranging through apical half of paramere (Fig. 1) ..... 14.

14. Paramere curving ventrally (Fig. 5) ..... ***L. litosisyra* sp. nov.**
Paramere virtually straight (Figs 1, 17) ..... 15.

15. Long setae of paramere restricted to tuft in apical fifth of free length (Fig. 17) ... ***L. vacamuerte* sp. nov.**
Long setae of paramere scattered throughout apical half of free length (Fig. 1) ... ***L. hedera* sp. nov.**

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